

amended Claims

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WHAT IS CLAIMED IS:

1. A dual connecting and disconnecting apparatus characterized by comprising:

a first hydraulic cylinder in which a piston is moved in a first direction which is parallel with an axis of the dual connecting and disconnecting apparatus by supplying hydraulic fluid into a first pressure chamber;

a second hydraulic cylinder which is integrally provided on a common support member and which is concentric with the first hydraulic cylinder in a position adjacent in the first direction to the first hydraulic cylinder, and in which a piston is moved in the first direction by supplying hydraulic fluid into a second pressure chamber;

a cylindrical connecting drum provided on a side wall portion of a cylinder tube of the first hydraulic cylinder integrally mounted to the support member, the connecting drum being centered around the axis and extending out in the first direction;

a first friction engaging device positioned farther to the first direction side than the second hydraulic cylinder, the first friction engaging device comprising (i) a first friction member provided on the connecting drum, this connecting drum being rotatable around the axis with respect to a first connecting member, the first friction member being non-rotatable with respect to the connecting drum, and (ii) a second friction member provided on the first connecting member, the second friction member being non-rotatable with respect to the first connecting member, the first friction engaging device connecting the support member with the first connecting member via the connecting drum by moving the piston of the first hydraulic cylinder in the first direction and engaging the first friction member of the connecting drum with the second friction member of the first connecting member; and

a second friction engaging device positioned farther to the first direction side than the second hydraulic cylinder and adjacent in the axial direction to the first friction engaging device, the second friction engaging device comprising (i) a third friction member provided on the connecting drum, this connecting drum being rotatable around the axis with respect to a second connecting member, the third friction member being non-

rotatable with respect to the connecting drum, and (ii) a fourth friction member provided on the second connecting member, the fourth friction member being non-rotatable with respect to the second connecting member, the second friction engaging device connecting the support member with the second connecting member via the connecting drum by moving the piston of the second hydraulic cylinder in the first direction and engaging the third friction member of the connecting drum with the fourth friction member of the second connecting member,

in that a cylinder tube of the second hydraulic cylinder is provided separately from the piston of the first hydraulic cylinder, and is fixed integrally to the support member, and

the first friction member and the second friction member of the first friction engaging device and the third friction member and the fourth friction member of the second friction engaging device are fitted into the connecting drum from an end portion thereof on the first direction side from the direction opposite the first direction, and are prevented from moving in the first direction by a stopper member integrally attached to the connecting drum

wherein among the first friction engaging device and the second friction engaging device, the friction member of the one friction engaging device arranged on the side opposite the first direction side in the axial direction is prevented from the first direction side, from moving in the first direction by a spacer fitted to the connecting drum so as to be non-rotatable with respect thereto; and

the friction member on the connecting drum side of the other friction engaging device positioned on the first direction side is fitted to the spacer so as to be non-rotatable with respect thereto, and is prevented, along with the spacer, from moving in the first direction by the stopper member.

2. The dual connecting and disconnecting apparatus according to claim 1, characterized in that:

among the first friction engaging device and the second friction engaging device, the friction member on the connecting drum side of the one friction engaging device arranged on the side opposite the first direction side in the axial direction is mounted to the connecting drum so as to be non-rotatable with respect thereto; and

the piston of the hydraulic cylinder that engages the friction member of the other friction engaging device positioned on the first direction side extends through a notch formed in the friction member of the one friction engaging device and abuts against the friction member of the other friction engaging device.

3. The dual connecting and disconnecting apparatus according to claim 1, characterized in that:

the first friction member and the second friction member are pressed together between the piston of the first hydraulic cylinder and the stopper member and engaged by moving the piston in the first direction; and

the third friction member and the fourth friction member are pressed together between the piston of the first hydraulic cylinder and the stopper member via the spacer and engaged by moving the piston in the first direction.

4. The dual connecting and disconnecting apparatus according to claims 1 or 3, characterized in that:

an annular flange bent at a substantially right angle away from the connecting drum so as to be substantially parallel with the friction member of the one friction engaging device is integrally provided on an end of the spacer.

5. The dual connecting and disconnecting apparatus according to any one of claims 1 to 4, characterized in that:

the spacer is prevented from moving in the direction opposite the first direction by an abutting portion provided integrally with the connecting drum so as to allow fitting of the friction member of the one friction engaging device, and is held in position between the abutting portion and the stopper member.

6. The dual connecting and disconnecting apparatus according to any one of claims 1 to 5, characterized in that:

the support member is a rotating input shaft of the dual connecting and disconnecting apparatus.

7. The dual connecting and disconnecting apparatus according to any one of claims 1 to 6, characterized in that:

the first friction member and the second friction member of the first friction engaging device are provided in plurality; and

the third friction member and the fourth friction member of the second friction engaging device are provided in plurality.